

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Louis B. Rosenberg
Application No. : 10/780,852
For : **Computer Interface Apparatus Including Linkage Having Flex**
Filed : February 19, 2004
Examiner : Jeffrey A. Brier
Art Unit : 2628

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

This is an Appeal Brief filed under 37 C.F.R. § 41.37 in connection with the final rejection of claims 82-90, 92, 102-106 in the Final Office Action mailed July 10, 2009 (the “Final Office Action”). Each of the topics required by 37 C.F.R. § 41.37 is presented herewith and labeled appropriately.

Real Party in Interest

The real party in interest in the present application is the assignee, Immersion Corporation, 801 Fox Lane, San Jose, California 95131 (hereinafter “Appellant”).

Related Appeals and Interferences

Appellant and the Appellant’s legal representative know of no appeals or interferences that will directly affect, will be directly affected by, or have a bearing on the Board’s decision in this appeal.

Status of Claims

Claims 82-90, 92, and 102-106 are currently pending and were finally rejected. Their rejection is the substance of this appeal. Claims 1-81, 91, and 93-101 were cancelled during prosecution.

Status of Amendments

Applicant has not sought to amend the claims after the mailing of the Final Office Action.

Summary of the Claimed Subject Matter

The present applications includes two independent claims: claims 82 and 90. Each is directed to an apparatus including a manipulandum. The apparatus is configured to allow the manipulandum in three different degrees of freedom and to sense a position and a movement of the manipulandum.

The first element of claim 82 recites “a manipulandum oriented along a longitudinal axis.” The specification describes a manipulandum oriented along a longitudinal access throughout, either explicitly or inherently, such as, for example, in Figures 2-4, 6, 12-18, 21 and 22 and their corresponding descriptions.

The second element of claim 82 recites “a linkage coupled to the manipulandum, the linkage configured to allow the manipulandum to move in at least two rotational degrees of freedom with respect to ground,” The specification describes a linkage providing two rotational degrees of freedom with respect to ground from, for example, page 14, line 30 through page 15, line 28, page 16, line 21 through page 17, line 22, and throughout the specification. In addition, Figures 2, 12, 15, 16, and 18, for example, show such a linkage and two rotational degrees of freedom.

The second element of claim 82 further recites that “the linkage further [is] configured to allow the manipulandum to move in a translational degree of freedom through an aperture of a portion of the linkage along the longitudinal axis.” The specification discloses from page 31, lines 14-24, referring to Figure 12, that “object member 216 preferably includes an aperture through which a linear axis member 204 or user object 44 can translate.” In addition, see Figure 6 and the corresponding description of a translational degree of freedom through an aperture.

The second element of claim 82 further recites “the linkage including a plurality of elements, at least a subset of elements from the plurality of elements being flexible and moveable to allow said manipulandum to move in at least one of said at least two degrees of freedom with respect to ground.” See, for example, Figure 12 and the accompanying description, such as on page 30, lines 9-16, which recites “[t]he central members 212a and 212b are flexible members having a torsion flex (twist) and bending compliance so that the object 44 can be moved in two or three degrees of freedom about axes A, B, and C.”

The third element of claim 82 recites “at least one sensor configured to detect at least one of a position and a movement of the manipulandum in the at least two degrees of freedom and output a sensor signal based on the detected at least one of the position and the movement.” The specification discloses a variety of sensors for detecting movement of a manipulandum. For example, page 16, lines 6-10, and page 17, line 32 through page 19, line 13, disclose a variety of sensors for detecting movement in one or more degrees of freedom.

Independent claim 90 recites, in its first element, “a manipulandum having a shaft oriented along a longitudinal axis and configured to be moveable in at least two rotational degrees of freedom about axes of rotation with respect to ground.” The specification describes a manipulandum oriented along a longitudinal axis throughout, either explicitly or inherently, such as, for example, in Figures 2-4, 6, 12-18, 21 and 22 and their corresponding descriptions. In addition, Figures 2, 12, 15, 16, and 18 and their corresponding descriptions, for example, show a manipulandum moveable in two rotational degrees of freedom about axes of rotation with respect to ground.

The second element of claim 90 recites “a first member coupled to the shaft of the manipulandum and having an aperture configured to allow the manipulandum to move along the longitudinal axis in a translational degree of freedom with respect to ground.” The specification discloses in page 31, lines 14-24, referring to Figure 12, that “object member 216 preferably includes an aperture through which a linear axis member 204 or user object 44 can translate.” In addition, see Figure 6 and the corresponding description of a translational degree of freedom through an aperture.

The third and fourth elements of claim 90 recites “a second member coupled to the first member and having a flexible characteristic; and a third member coupled to the first member and having a flexible characteristic.” See, for example, Figure 12 and the accompanying description,

such as on page 30, lines 9-16, which recites “[t]he central members 212a and 212b are flexible members having a torsion flex (twist) and bending compliance so that the object 44 can be moved in two or three degrees of freedom about axes A, B, and C.”

Grounds of Rejection to be Reviewed on Appeal

There are two issues presented for appeal:

- (1) Did the Examiner err in rejecting claims 82-88, 90, 92 and 102-106 under 35 U.S.C. § 103(a) as allegedly being unpatentable over an article by Adelstein et al (“Adelstein”) in view of the knowledge of one of ordinary skill in the art?
- (2) Did the Examiner err in rejecting claim 89 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Adelstein in view of an article by R.L. Hollis and S.E. Salcudean (“Hollis”)?

Argument

Issue 1: Whether the Examiner erred in rejecting claims 82-88, 90, 92, and 102-106 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Adelstein in view of the knowledge of one of ordinary skill in the art.

Because Adelstein in view of the asserted knowledge of one of ordinary skill in the art does not disclose “the linkage further configured to allow the manipulandum to move in a translational degree of freedom through an aperture of a portion of the linkage along the longitudinal axis” as recited in claim 82-88, 90, 92, and 102-106, claims 82-88, 90, 92, and 102-106 are patentable over Adelstein in view of the asserted knowledge of one of ordinary skill in the art.

To establish *prima facie* obviousness of a claimed invention under 35 U.S.C. § 103, the Office Action must show, either from the references themselves or in the knowledge generally available to one of ordinary skill in the art, that the cited references disclose or suggest each claimed element.¹

¹ See MPEP §§ 2141 and 2143; *Graham v. John Deere Co.*, 383 U.S. 1 (1966); *KSR Int’l Co. v. Teleflex, Inc.*, 82 U.S.P.Q.2d at 1395-96; *Graham v. John Deere Co.*, 383 U.S. 1 (1966); *KSR Int’l Co. v. Teleflex, Inc.*, 82 U.S.P.Q.2d at 1395-96.

In the Final Office Action, the Examiner argued that Adelstein inherently discloses a movement of a manipulandum in a translational degree of freedom along a longitudinal axis. Specifically, the Examiner states:

This argument is also not persuasive because the thrust bearing discussed in the first full paragraph on page 8 clearly allows some movement in the longitudinal axis even though the thrust bearing would inhibit movement along the longitudinal axis. Applicant has not claimed a range of movement outside of the range allowed for by the thrust bearing. Applicant has not claimed any use for having movement along the longitudinal axis while Adelstein has discussed use for having movement tangential to the longitudinal axis by "measurement of interface forces tangent to the two dimensional manipulandum workspace". See Baer, US Patent No. 4,976,008, in the Abstract and at column 2 lines 22 and 41, column 6 line 24, column 7 line 51, and column 8 line 54 which describes a thrust bearing inhibits but not prevents longitudinal movement.²

Regarding the disclosure of longitudinal movement, each portion of Baer cited by the Examiner states that the thrust bearing inhibits longitudinal movement. The Examiner asserts that the thrust bearing does prevent longitudinal movement. This assertion is incorrect. "Inhibit" means "to restrain or hold back; prevent" (emphasis added) and "to prohibit; forbid."³ Thus, Baer discloses that its thrust bearings inhibit, or prevent, longitudinal movement. Therefore, one of skill in the art with knowledge of Baer would understand that the Adelstein thrust bearings prevent longitudinal movement.

The Examiner attempted to further his argument in an Advisory Action mailed September 15, 2009 (the "Advisory Action"). In the Advisory Action, the Examiner asserts that the definition of the term "inhibit" in the context of the Baer patent does not mean "prevent" because "thrust bearings needs some clearance in order to operate without binding."⁴ The Examiner then further cited to section 13A3 of a reference regarding reduction gears (the "Reduction Gear" reference), which discusses a drive shaft assembly of a diesel submarine that allegedly discloses a thrust bearing that allows movement along a longitudinal axis. However, the Examiner has misread the Reduction Gear reference.

Section 13A3 discusses a flexible coupling between the main motor armature shafts and the pinion shafts of the reduction gear. As shown in Figure 13-2 of the reference, the flexible

² See Final Office Action, p. 3.

³ See The American Heritage Dictionary, Second College Edition, 661, Houghton-Mifflin Co. (1985).

⁴ See Advisory Action, p. 2.

couplings discussed in Section 13A3 refer to the labeled “main motor flexible coupling.” Neither of these two flexible couplings is a thrust bearing. A clearly labeled thrust bearing is located in a wholly-different part of the disclosed assembly. The only discussion relating to the thrust bearing states that “the movement of the main gear is limited by clearance in the thrust bearing.”⁵ However, the anticipated direction of movement of the main gear is not disclosed. Thus, the newly-added reference does not disclose movement in a translational degree of freedom along a longitudinal axis.

Finally, the Examiner appears to have mistaken the difference between movement tangent to the two degrees of freedom described in Adelstein and movement along a longitudinal axis:

Applicant has not claimed any use for having movement along the longitudinal axis while Adelstein has discussed use for having movement tangential to the longitudinal axis by measurement of interface forces tangent to the two-dimensional manipulandum workspace.⁶

However, as discussed in a response to Office Action submitted on May 12, 2009 and as shown in Figure A below,⁷ translation in a direction tangent (B) to a rotational degree of freedom (A), as alleged by the Examiner, is not translation along the longitudinal axis (C), as described in the present specification. Longitudinal axis C cannot be tangent to rotational degree of freedom A because axis C would intersect the degree of freedom A at two points, rather than at a single point as required for a tangent. Thus, movement tangent to the rotational degrees of freedom is insufficient to show motion along a longitudinal axis.

⁵ See Reduction Gear reference, p. 4.

⁶ See Office Action, p. 3.

⁷ See also, Figures 2, 12, 15, 16, and 18 of the present application, which show a longitudinal axis in relation to rotational degrees of freedom.

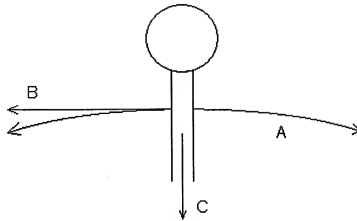


Figure A

Thus, because the plain meaning of “inhibit” is to “prevent,” despite Examiner’s unsupported assertions to the contrary, and because the combination of references cited by the Examiner do not disclose a manipulandum moving in a translational degree of freedom along a longitudinal axis, claim 82 is patentable over Adelstein in view of the asserted knowledge of one of ordinary skill in the art.

Similar to claim 82, claim 90 recites “a first member coupled to the shaft of the manipulandum and having an aperture configured to allow the manipulandum to move along the longitudinal axis in a translational degree of freedom with respect to ground.” Claim 90 is patentable over the cited references for at least the same reasons as claim 82.

Because claims 83-88, 92 and 102-106 each depend from and further limit one of claims 82 or 90, each of claims 83-88, 92 and 102-106 is patentable over the cited references for at least the same reasons.

Applicant respectfully requests the Board reverse the Examiner’s rejection of claims 82-88, 90, 92, and 102-106.

Issue 2: Whether the Examiner erred in rejecting claim 89 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Adelstein in view of Hollis and the asserted knowledge of one of ordinary skill in the art.

Because Adelstein in view of Hollis and the asserted knowledge of one of ordinary skill in the art does not disclose “the linkage further configured to allow the manipulandum to move

in a translational degree of freedom through an aperture of a portion of the linkage along the longitudinal axis” as recited in claim 82, from which claim 89 depends, claim 89 is patentable over Adelstein in view of the asserted knowledge of one of ordinary skill in the art.

Claim 89 depends from and further limits claim 82. As explained above, Adelstein in view of the skill in the art does not disclose or suggest all of the limitations of claim 82. Hollis does not cure the deficiencies of Adelstein in view of one skill in the art. The Examiner has introduced Hollis to teach a voice coil as an example of a Lorentz motor. However, Hollis does not disclose or suggest “the linkage further configured to allow the manipulandum to move in a translational degree of freedom through an aperture of a portion of the linkage along the longitudinal axis” as recited in claim 82, from which claim 89 depends. Thus, the combination of Adelstein, Hollis, and the asserted knowledge of one of ordinary skill in the art do not disclose or suggest “the linkage further configured to allow the manipulandum to move in a translational degree of freedom through an aperture of a portion of the linkage along the longitudinal axis.” Therefore, claim 89 is patentable over the combined references.

Applicant respectfully requests Board reverse the Examiner’s rejection of claim 89.

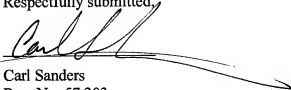
Conclusion

Applicant respectfully asserts that in view of the foregoing arguments, all pending claims are allowable. Applicant respectfully requests the Board reverse the Examiner on all counts.

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Appendix A – Claims

82. An apparatus, comprising:

a manipulandum oriented along a longitudinal axis;

a linkage coupled to the manipulandum, the linkage configured to allow the manipulandum to move in at least two rotational degrees of freedom with respect to ground, the linkage further configured to allow the manipulandum to move in a translational degree of freedom through an aperture of a portion of the linkage along the longitudinal axis, the linkage including a plurality of elements, at least a subset of elements from the plurality of elements being flexible and moveable to allow said manipulandum to move in at least one of said at least two degrees of freedom with respect to ground; and

at least one sensor configured to detect at least one of a position and a movement of the manipulandum in the at least two degrees of freedom and output a sensor signal based on the detected at least one of the position and the movement.

83. The apparatus of claim 82, further comprising an actuator coupled to the linkage, the actuator configured to output via the subset of elements a feedback force along at least one of the at least two degrees of freedom.

84. The apparatus of claim 82, wherein the linkage includes:

a ground member configured to be coupled to a ground surface;

a first extension member and a second extension member, the first extension member and the second extension member being coupled to the ground member; and

a first central member and a second central member, the first central member having an end coupled to the first extension member, the second central member having an end coupled to the second extension member, the first central member and the second central member being coupled to each other at ends opposite the ends coupled to the first extension member and the second extension member.

85. The apparatus of claim 82, wherein the linkage includes:

a ground member configured to be coupled to a ground surface;

a first extension member and a second extension member, the first extension member and the second extension member being coupled to the ground member; and

a first central member and a second central member, the first central member having an end flexibly coupled to the first extension member, the second central member having an end flexibly coupled to the second extension member, the first central member and the second central member being coupled to each other at ends opposite the ends coupled to the first extension member and the second extension member.

86. The apparatus of claim 82, wherein the linkage includes:

a ground member configured to be coupled to a ground surface;

a first extension member and a second extension member, the first extension member and the second extension member being coupled to the ground member; and

a first central member and a second central member, the first central member having a first end coupled to the first extension member, the second central member having a first end coupled to the second extension member, a second end of the first central member and a second

end of the second central member being coupled to each other, the ground member being rotatably coupled to the first extension member and the second extension member by bearings, the bearings configured to permit rotation of the first extension member and the second extension member.

87. The apparatus of claim 82, wherein at least one element from the subset of elements is narrower in a dimension in which that element is configured to flex, and is wider in other dimensions in which that element is configured to be substantially inflexible.

88. The apparatus of claim 82, further comprising:

a first actuator coupled to the linkage, the actuator configured to output via the subset of elements a feedback force in at least one of the at least two degrees of freedom based on the sensor signal; and

a second actuator coupled to the ground member, the second actuator being configured to apply a feedback force in at least one of the at least two degrees of freedom based on the sensor signal, the feedback force associated with the second actuator being different from the feedback force associated with the first actuator.

89. The apparatus of claim 82, further comprising an actuator coupled to the linkage, the actuator configured to output via the subset of elements a feedback force along at least one of the at least two degrees of freedom, the actuator including a voice coil actuator configured to impart the feedback force on the manipulandum.

90. An apparatus, comprising:

a manipulandum having a shaft oriented along a longitudinal axis and configured to be moveable in at least two rotational degrees of freedom about axes of rotation with respect to ground;

a first member coupled to the shaft of the manipulandum and having an aperture configured to allow the manipulandum to move along the longitudinal axis in a translational degree of freedom with respect to ground;

a second member coupled to the first member and having a flexible characteristic; and

a third member coupled to the first member and having a flexible characteristic.

92. The apparatus of claim 90, wherein, the second member has a first dimension about which the second member is configured to flex, and has a second dimension about which the second member is configured to be substantially inflexible.

102. The apparatus of claim 90, further comprising: an actuator coupled to the manipulandum, the actuator configured to output a feedback force along at least one of the at least two degrees of freedom.

103. The apparatus of claim 90, further comprising: a sensor configured to detect a position of the manipulandum along at least one of the at least two degrees of freedom and output a sensor signal based on the detected position.

104. The apparatus of claim 90, wherein the manipulandum

includes one of a simulated surgical tool, a stylus, or a joystick.

105. The apparatus of claim 90, wherein, the third member has a first dimension about which the third member is configured to flex, and has a second dimension about which the third member is configured to be substantially inflexible.

106. The apparatus of claim 90, wherein the second member is coupled to a first inflexible extension member and the third member is coupled to a second inflexible extension member, wherein the first and second extension members are coupled to ground.

Appendix B – Evidence

None.

Appendix C – Related Proceedings

None.